

## Determinants of Depressive Symptoms in People Living with HIV in the Case of Low-Resource Communities in Eastern Ethiopia: A Multi-Centered Study

Ebisa Zerihun\* and Firaol Girma

Department of Nursing, Oda Bultum University, Ethiopia

\*Corresponding Author

Ebisa Zerihun, Department of Nursing, Oda Bultum University, Ethiopia.

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### Abstract

**Introduction:** Depression in people living with HIV (PLHIV) has become an urgent issue. The HIV/AIDS pandemic cannot end without addressing the mental health of PLHIV through integrated approaches; besides, depression in PLHIV might be unrecognized and undertreated, whereas some manifestations of HIV and depression are mirrored. Therefore, the aim of this study was to assess depressive symptoms and associated factors in PLHIV in Eastern Ethiopia to further interventions.

**Methods:** 420 PLHIV participated in this cross-sectional study and completed the Patient Health Questionnaire-9. Medical record reviews and pretested, structured face-to-face interviews were used to collect the data. A multivariate logistic regression model was used to examine the odds ratios for the existence of depressive symptoms, including sociodemographic information, and comorbidities as relevant variables. Statistically significant variables were determined using *P* values of 0.05.

**Results:** We found over all prevalence of depressive symptoms in PLHIV was 52.4% (95% CI = 47.6–57.1). Employment status [AOR = 0.22 (95% CI = 0.13–0.36)], recent CD4 count [AOR = 6.99 (95% CI = 2.81–17.38)], duration on ART [AOR = 5.05 (95% CI = 2.38–10.74)], and chronic non-communicable diseases (NCDs) [AOR = 7.90 (95% CI = 4.21–14.85)] were significantly associated with depressive symptoms among PLHIV on treatment.

**Conclusion:** In this study, almost half of adult PLHIV receiving ART drugs had depressive symptoms. Employment was found to be preventive, while low CD4 counts, starting ART drugs recently, and the presence of chronic NCDs increased the risk of developing depression. Mental health screening and NCD intervention packages should be integrated into and offered at HIV care clinics.

**Keywords:** HIV/AIDS, Depressive Symptom, ART, Factors, Eastern Ethiopia, NCDs

### Abbreviations

CD4: Cluster of differentiation 4

AOR: Adjusted Odds Ratio

ETB: Ethiopian Birr

PHQ: Patient Health Questionnaires

COR: Crude Odds Ratio

PLHIV: People Living with HIV

ART: Antiretroviral Therapy

NCDs: Non-Communicable Diseases

### 1. Introduction

Human immunovirus (HIV) has become a challenge for the global population. Globally, it affects more than 37.7 million people, and 70% of patients are from sub-Saharan Africa and 27.5 million people were accessing antiretroviral therapy (ART) through the end of 2020 [1-3]. HIV is becoming a serious community concern; 610,335 people are living with HIV (PLHIV) in Ethiopia, with an estimated adult HIV prevalence of 1.16%, of which nearly 96-99% have started ART treatment [4,5].

People living with HIV (PLHIV) are disproportionately affected by mental health problems [6,7]. Different pieces of literature display that mental health issues are common among PLHIV, those at risk of or affected by HIV, often at higher rates than in the general population [7-11]. The previous study indicated that depression prevalence among PLHIV in sub-Saharan Africa is estimated at 24%, compared with less than 3% for the general population [8]. According to a review of the literature, in Ethiopia, the magnitude of depression among PLHIV on treatment was 36.65% (95% CI: 25.48–47.82) compared with 9.10% (95% CI: 8.40–9.90%) in the general population [12]. Furthermore, in the COVID-19 era, PLHIVs not only have a higher risk of severe illness but also might have an increased risk of mental health problems (depression, anxiety), which are associated with stress, social isolation, and stigma [13,14].

Depression is a common mental health condition manifested by a loss of pleasure or interest, changes in sleep and appetite, poor

concentration, uncomfortable or immoral feelings, easily getting fatigued and repeated feelings of death or suicide [15]. HIV infection and depression have a bidirectional relationship in which depression increases the risk of HIV infection and PLHIV has an increased risk of depression because of worsening clinical symptoms, coping with the diagnosis, social rejection, co-existing poverty, and the side effects of certain ART drugs [16,17]. Similarly, depression is associated with increased behaviors, lower adherence to HIV treatment, and lower engagement with HIV prevention [9,18].

Even though depression and HIV are linked, very little is known about the depression prevalence and factors associated with PLHIV on ART drugs, especially in a limited resource setting. As well as still, factors that lead to depressive symptoms are heterogeneous among PLWH, and local evidence is required for context-based decision-making and intervention. Additionally, the AIDS pandemic cannot end without addressing the mental health of PLHIV through integrated approaches; besides, depression in PLHIV might be unrecognized and undertreated where some manifestations of HIV and depression are mirrored [19]. Thus, to mitigate HIV and mental health issues and end the AIDS epidemic, it is necessary to generate informative and context-based evidence.

Therefore, this study was conducted to assess the prevalence of depression and to identify the association between depression and sociodemographic, psychosocial, and clinical-related characteristics among HIV/AIDS-positive patients on treatment at public health facilities in the West Hararghe Zone in Eastern Ethiopia.

## 2. Methods

### 2.1. Study Period and Area

The study was conducted in selected public health facilities in the West Hararghe Zone from February 1, 2022, to May 25, 2022. West Hararghe zone is one of the zones found in the Oromia regional state with the capital city of Chiro. It is located 326 km away from Addis Ababa, the capital city of Ethiopia, in the eastern part of the country. There are 38 health centers and seven hospitals in the West Hararghe zone. Of these public health facilities, four hospitals and four health centers provided first- and second-line ART treatment levels. According to Ethiopia's national HIV/AIDS guideline, health centers with greater than 20 HIV-positive patient loads are allowed to recruit second-line treatment levels [4]. This study included both HIV patients on first- and second-line ART treatment levels. Currently, more than 3,460 people living with HIV (PLHIV) are attending ART clinics in the public health facilities of the west Hararghe zone. Furthermore, all facilities have a similar reporting and documentation system, and HIV/AIDS data are handled by the ART registration logbook and chronic ART follow-up form [20]. These registrations are updated at every clinical visit, and currently, PLHIV follow-ups are scheduled every three months.

### 2.2. Study Design and Population

An institutionally based multicenter cross-sectional study was conducted. During the study period, all adults (aged 18 years or older) who were on ART follow-up at eight selected health institutions were included in the study population. This study included patients who were at least 18 years old and had been on ART for at least one month. Patients who were critically ill and unable to communicate were excluded from this study.

### 2.3. Sample Size Determination and Sampling Procedure

The sample size of 420 was calculated based on a formula for single population proportion by assuming a prevalence of depression among people living with HIV of 45 percent, a level of Confidence at 95%, a margin error of 5%, and a 10% non-response rate [21].

We purposefully selected four hospitals and four health centers that offered first and second line ART treatment levels. Proportionally allocate the sample size to four hospitals and four health centers based on the number of adult patients who received follow-up ART services in the previous month. At each facility, selected participants fulfilling inclusion criteria were selected using systematic random sampling techniques by determining a sample interval ( $K = 5$ ). The first starting participants were randomly selected using a lottery method, and then every fifth participant was next interviewed.

### 2.4. Variables and Measurements

Participants are required to rate how frequently they had depressive symptoms during the two weeks prior to evaluation for each item. The total score ranges from 0 to 27. The severity of depression symptoms was divided into five categories: not depressed (0 to 4 points), mild depression (5 to 9 points), moderate depression (10 to 14 points), moderately severe (15 to 19 points), and severe depression (20 to 27 points). In this study, to determine the prevalence of depressive symptoms, HIV/AIDS patients who scored a PHQ-9 score of 5 were considered depressed.

Sex, age, education, marital status, income source, and substance usage are among the socio-demographic factors. Likewise, the following patient clinical characteristics were included: Impairment of daily work activities, viral load, WHO clinical stage, presence of chronic non-communicable diseases (NCDs), and medication adherence. An individual's NCD status was evaluated using a self-report and review document. Chronic NCD is defined as a patient who has one or more of the following confirmed: Diabetes, cardiac diseases, hypertension, and asthma. HIV patients with a viral load below 1000 copies/mL are considered to have low viremia unless they have been classified as having a high viral load (high viremia) [17].

### 2.5. Data Collection Tool and Procedure

Data were collected using both document review and structured face-to-face interviews with eight trained nurses with Bachelor of Science (BSc) degrees in nursing using the local language (Afaan

Oromo) from February 2, 2012, to May 25, 2022, while the patient came for a routine ART follow-up. The questionnaire was developed in English, translated into Afaan Oromo (the local language) by language experts to maintain consistency before the actual data collection, and then translated back into English.

The structured face-to-face interviews administered the questionnaire, which included socio-demographic and psychosocial conditions adapted and modified from reviewing different similar literature by considering the local situation of the study participants. Moreover, medical record reviews also extract the clinical profile of patients (CD4 level, viral load, stages of HIV, medication side effects, opportunistic infections, and presence of chronic NCDs). The extraction checklist was organized per the national consolidated antiretroviral guideline [20].

### 2.6. Data Quality Assurance and Control

To ensure the quality of the data, the questionnaires were pretested among 21 HIV-positive patients attending the ART clinic of Chalanko Hospital, which is located in the East Hararghe Zone, Eastern Ethiopia, and necessary modifications were made before actual data collection. Additionally, training was given to data collectors on the tool and the ethics of confidentiality. Furthermore, the data collection procedures were closely supervised, and on-site feedback was given. The questionnaires were translated into the local language and back to English using backward and forward translation.

### 2.7. Data Processing and Analysis

The gathered information was examined, cleaned up, and entered into Epi-data version 4.2 before being exported and analyzed in the statistical package for SPSS version 25. To present the descriptive results of the study, frequency, proportions, graphs, and cross

tabs were used. First, the PHQ-9 depression measurement scale was computed and recorded to get the prevalence of depressive symptoms. Binary logistic regression was employed to assess the association between depression and potentially independent variables. Variables with a p-value of 0.25 were selected for multivariate analysis. The strength of the association was interpreted using a 95% CI and odds ratio. A p-value less than 0.05 was considered statistically significant in the multivariable analysis of this study. The variance inflation factor in the final model was less than 10, and consequently, it was checked by using the Hosmer and Lemeshow test, which resulted in a p-value of 0.26.

### 2.8. Ethics Approval and Consent to Participation

The Oda Bultum University, Department of Nursing's Ethical Review Committee granted their clearance with a reference number of Nurs/R/C/055/2014. Written consent was obtained from each participant based on his or her voluntary participation in accordance with the Declaration of Helsinki after the study's goal was explained and confidentiality was ensured. Written consent was obtained from each participant based on their voluntary participation in accordance with the Declaration of Helsinki after the study's goal was explained and confidentiality was ensured.

## 3. Results

### 3.1. Socio-Demographic Characteristics of PLHIV on ART

A total of PLHIV who are taking ART participated in this study, with a response rate of 100%. Among them, 64.0% (n = 269) of the participants were female and 48.1% (n = 202) were married. Nearly one-third, 36.4% (n = 153), of the study participants attended primary schools, and 88.1% (n = 370) were urban residents. Nearly half (46.9%, n = 197) of HIV-positive patients who received ART drugs were unemployed (Table 1).

Variables	Categories	Frequency (N)	Percent (%)
Age of the Participant in Years	18-25	25	6.0
	26-35	49	11.7
	36-45	162	38.6
	>46	184	43.8
Sex of the Participant	Male	151	36.0
	Female	269	64.0
Residence	Urban	370	88.1
	Rural	50	11.9
Educational Status	No formal education	88	21.0
	Primary education	153	36.4
	Secondary education	123	29.3
	Diploma and above education	56	13.3
Marital Status	Married	202	48.1
	Divorce	77	18.3
	Single	47	11.2

	Widowed	94	22.4
Ethnic Group	Oromo	360	85.7
	Amhara	48	11.4
	Others <sup>a</sup>	12	2.9
Religion	Muslim	299	71.2
	Orthodox	65	15.5
	Protestant	56	13.3
Employment Status	Employed	223	53.1
	Unemployed	197	46.9
Income (ETB) per Month	<1000	183	43.6
	1001-5000	218	51.9
	>5001	19	4.5

Key: <sup>a</sup>Wolliata, Tigray, Somali.

ETB- Ethiopian Birr

**Table 1: Socio-Demographic Characteristics of People Living With HIV on ART at Public Health Facilities, West Hararghe Zone, Eastern Ethiopia, February to May 2022**

### 3.2. Behavioral, Psychosocial, and Clinically Related Characteristics of HIV-Positive Patients on ART

About 10% (n = 42) of the study participants currently consume alcohol, while two thirds (73.3% (n = 308) are currently chewing tobacco. Among the study participants, 6.0% (n = 25) had a past psychiatric history, while 2.9% (n = 12) were taking antidepressants. In addition, 15.5% (n = 65) of respondents replied that they had poor social support and 13.6% (n = 57) had impairments in activities of daily living.

Regarding viral suppression, 95.5% (n = 401) of the patients had low viremia (1000 copies/mm<sup>3</sup>), and 16.0% (n = 67) of the patients had a CD4 count less than 200 cells/mm<sup>3</sup>. Furthermore, the majority, 89.3% (n = 375) of the HIV-positive patients, were in clinical stages II, while 8.3% and I (n = 35) were on second-line ART treatment, and 10.5% (n = 44) of patients developed medication side effects. In addition, 36.9% (n = 155) of HIV-positive patients had ever developed an opportunistic infection. Overall, 27.9% (n = 117) of the HIV-positive patients had at least one chronic non-communicable disease (Table 2).

Variable	Categories	Frequency(N)	Percent (%)
Current Alcohol Consumption	Yes	42	10.0
	No	378	90.0
Current Chewing Chat	Ye	308	73.3
	No	112	26.7
Current Smoking Cigarettes	Yes	202	48.1
	No	212	51.9
Past Depression History	Yes	25	6.0
	No	395	94.0
Taking Anti-Depressant	Yes	12	2.9
	No	408	97.1
Family History of Psychiatric Illness	Yes	26	6.1
	No	394	93.9
Poor Social Support	Yes	65	15.5
	No	355	84.5
Independent Source of Income	Yes	307	73.1
	No	113	26.9

Impairment In Activities of Daily Living	Yes	57	13.6
	No	363	86.4
Felt Stigmatization	Yes	132	31.4
	No	228	68.6
Current Viral Load	>1000 copies/dL	19	4.5
	<1000 copies/dL	401	95.5
Recent CD4 Count	<200 cells /mm <sup>3</sup>	67	16.0
	200-499 cells/mm <sup>3</sup>	194	46.1
	>500 cells/mm <sup>3</sup>	159	37.9
Who Clinical Stage	Stage I &II	375	89.3
	Stage III&IV	265	10.7
Ever Developed An Opportunistic Infection	Yes	155	36.9
	No	265	63.1
Duration Of Since Art Treatment Started	<24 months	76	18.1
	>24 months	344	81.9
Treatment Level	First Line	385	91.7
	Second Line	35	8.3
Any Art Medication Side Effect	Yes	44	10.5
	No	376	89.5
Art Medication Adherence	Adhered	400	95.2
	Not Adhered	20	4.8
Chronic Non-Communicable Diseases	Presence	117	27.8
	Diabetes	35	8.3
	Hypertension	30	7.1
	Cardiac Diseases	11	2.6
	Asthma	41	9.8

**Table 2: Behavioral, Psychosocial, and Clinical Characteristics of Hiv-Positive Patients Who Attended Public Health Facilities, in Eastern Ethiopia, February to May 2022.**

### 3.3. Prevalence of Depressive Symptoms Among People Living with HIV on ART Follow-Up

The prevalence of depressive symptoms among patients taking ART drugs in public health facilities in west Hararge zone,

eastern Ethiopia, was 52.4% (95% CI = 47.6–57.1). Based on the PHQ-9 depression severity assessment scale, 33.3% (n = 140) of the study participants have minimal depression, while 9 (2.1%) have severe depression (Figure).

### Severity of depression as assessed by PHQ-9

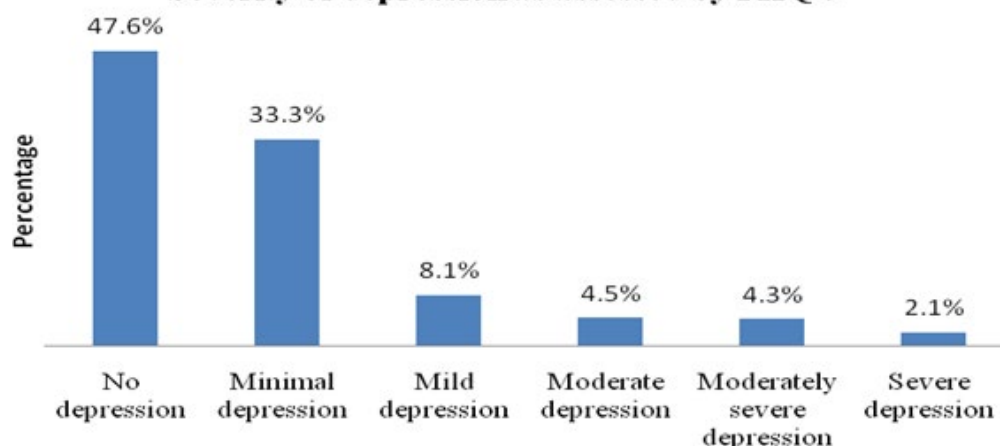


Figure: Shows the Level of Depression among HIV-Positive Individuals on ART at Public Health Facilities in the West Hararge Zone of Eastern Ethiopia in 2022 as Determined by the PHQ-9.

#### 3.4. Factors Associated with Depressive Symptoms among People Living with HIV Who are Taking ART

The bivariate analysis exposed that depressive symptom among PLHIV on ART had an association with educational level, employment status, current chewing tobacco use, family history of mental illness, recent CD4 count, duration on ART, and chronic non-communicable diseases, which were candidates for multiple logistic regression.

In this study, the employed individuals were 78% less likely to develop depressive symptoms than the unemployed were [AOR =

0.22; 95% CI: 0.13-0.36]. PLHIV who had the most recent CD4 count 200 cells/mm<sup>3</sup> were seven times more likely to develop depressive symptoms than those with a CD4 count >500 cells/mm<sup>3</sup> [AOR = 6.77 (95% CI: 2.81–17.38)]. Patients who received ART for less than 24 months were five times more likely to have depressive symptoms than those patients who stayed longer than 24 months on ART [AOR = 5.05 (95% CI: 2.38-10.74)]. HIV-positive patients with the co-morbid chronic non-communicable disease were eight times more likely to develop depressive symptoms than their counterparts [AOR = 7.90 (95% CI: 4.21-14.85)]. (Table 3) [22].

Variables	Depression		COR (95% CI)	AOR (95% CI)
	Yes	No		
<b>Educational Status</b>				
No formal education	50	38	2.19(1.10-4.354)	1.45 (0.59-3.54)
Primary education	84	69	2.02(1.08-3.80)	1.83 (0.81-4.14)
Secondary education	65	58	1.87(0.98-3.56)	1.46(0.63-3.36)
Diploma and above	21	35	1	
<b>Employment Status</b>				
Employed	84	139	0.27 (0.18-0.41)	0.22(0.13-0.36) **
Unemployed	136	61	1	1
<b>Current Chewing Chat</b>				
Yes	209	99	3.52(1.34-8.87)	2.82(0.69-6.23)
No	42	70	1	1
<b>Family History of Psychiatric Illness</b>				
Yes	20	5	3.90(1.43-10.59)	3.04(0.92-10.06)
No	200	195	1	1
<b>Recent Cd4 Cell Count</b>				
<200 cells /mm <sup>3</sup>	59	8	9.14(4.09-20.38)	6.99(2.81-17.38) *
200-499 cells/mm <sup>3</sup>	90	104	1.10(0.70-1.63)	1.03(0.62-1.71)

>500 cells/mm <sup>3</sup>	71	88	1	1
<b>Duration on ART</b>				
< 24 months	64	12	6.43(3.35-12.34)	5.05(2.38-10.74) *
>24 months	156	188		
<b>Chronic Non-Communicable Diseases</b>				
Yes	99	18	8.27(4.76-14.37)	7.90(4.21-14.85) *
No	121	182	1	1

N.B: Significant Association \*p-value <0.05 and \*\*p-value<0.01, 1- Reference Group

**Table 3: Factors Associated with Depressive Symptoms among PLHIV Who are Taking ART Drugs in a Public Health Facility, West Hararghe Zone, Eastern Ethiopia, 2022**

#### 4. Discussion

The current study evaluated the frequency of depression symptoms and their contributing variables among HIV-positive patients receiving ART follow-up in the West Hararghe Zone, Eastern Ethiopia. In this study, depressive symptoms were present in 52.4% (95% CI = 47.6-57.1) of HIV-positive individuals using ART. This result is consistent with a research conducted in Hawasa, Ethiopia (48.6%), Brazil (57.7%), and India (57%) [23,24]. But this study is lower than the study conducted in Sudan (63.1%), China (61%), and slightly higher than a study conducted in Harar, Ethiopia (45.8%), Cameroon (26.7%), and Southwest Nigeria (39.6%) [21,25-28]. These differences might be due to the difference in depression screening tools, socio-demographic and cultural variation, and study time [29]. Thus, it is important to improve mental health screening, prevention, and control methods in standard HIV clinical care.

Employed HIV patients were 78% less likely than jobless HIV patients to experience depressed symptoms, and Cameroon that revealed unemployment and low income were associated with depression among PLHV [27,28]. This might be because being employed will reduce the socio-economic burden that might impose additional stress on HIV-positive patients. In addition to the diagnosis of HIV, unemployment might put the patient under stress and worry. This double burden of stress might lead the patients to depressive disorder.

HIV-positive patients who had a recent CD4 count of fewer than 200 cells/mm<sup>3</sup> were seven times more likely to have depression than patients with a CD4 cell count of more than 500 cells/mm<sup>3</sup>. This finding is consistent with a study conducted in Hawassa, Ethiopia, southwestern Nigeria, and Uganda, which indicated that the current low CD4 count is a risk factor for depression among PLHIV [23,28,30]. On the other hand, among HIV-positive patients, an increase in CD4 was independently linked to a betterment in severe depressive disorder [31]. This might be because a low CD4 count might be associated with an opportunistic infection, which further brings additional worries, stress, and physical disabilities.

Patients who are taking ART for less than or equal to 24 months were five times more likely to develop depressive symptoms than those patients who stayed more than 24 months. In line with this

finding, the study conducted in rural Uganda exposed that there was an improvement in depressive symptoms over a long follow-up period after ART initiation [32]. Similarly, a study conducted by F Gutierrez et al. found that longer exposure to ART drugs was associated with a decreased incidence rate of depression [33]. This might be attributed to ongoing counselling and support the patients might receive about HIV diagnosis and treatment, which in turn might reduce mental stress and anxiety leading to symptoms of depression.

PLHIV with at least one comorbid chronic non-communicable disease (diabetes, hypertension, cardiac diseases, and asthma) were eight times more likely to develop depression than their counterparts. This finding is in line with the findings of other studies [21,34,35]. This may be because the concomitant chronic non-communicable diseases will significantly increase the strain on the already difficult task of combating HIV. Co-existing NCDs in PLHIV increase drug load, impede nutrition, exacerbate chronic pain, and interfere with sleep cycles. In addition, this raises the possibility of experiencing depression and other mental health problems [36]. Thus, intervention packages for NCD should be integrated with and delivered with HIV care at ART clinics.

#### 4.1. Strengths and Limitations of the Study

The potential strength of this study is that it was conducted within a multi-center setting, considered social and clinical variables simultaneously, and described the various factors associated with depressive symptoms among adult PLHIV. In addition, a few limitations might mean the finding cannot be generalized to all PLHIV because it misses those individuals with depression who may not attend public health facilities regularly. Additionally, because of the nature of the cross-sectional study, we were not able to identify a causal-effect relationship and were prone to recall bias that affects the magnitude of depression, which is another potential limitation of this study.

#### 5. Conclusion

In the current study, 1 in 2 people living with HIV on ART drugs was depressed. Employed patients were less likely to develop depression. However, PLHIV with a recent CD4 cell count of fewer than 200 cells/mm<sup>3</sup> and those PLHIV taking ART drugs for less than or equal to 24 months in the presence of chronic non-commu-

nicable diseases were at increased risk of developing depressive symptoms. Therefore, programs working on HIV need to incorporate mental health screening and NCD intervention packages into routine HIV/AIDS care. In addition, healthcare providers who work in ART clinics should give due attention to unemployed patients, patients with a low CD4 count, and patients with newly initiated ART, and patients with co-morbid chronic non-communicable diseases. Future researchers should conduct prospective, longitudinal studies on risk factors to get better findings.

### Data Sharing Statement

In the current study, the data sets analyzed are available from the corresponding author upon reasonable request.

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